Rights, responsibilities and resources

The Tucuruí dam of Brazil

By

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Introduction

This paper will deal with large dams and the right to resources. According to the final report of the World Commission on Dams, 30-40 percent of the irrigated land worldwide relies on dams. This means that about 800 million people are benefiting from food that is produced by dam related agriculture. Furthermore, 19 percent of all electricity in the world is generated by dams, serving possibly 800 million people (WCD, 2001c). However, during the last two decades, criticism on large dams has grown. Considerable problems have arisen because of social, economical and environmental impacts.

To explain this debate, the paper will first focus on two international organisations, which are the World Commission on Dams and the International Commission on Large Dams. Their names are more or less the same, but their visions vary quite from each other. The second part of the paper deals offers a new framework for analysing resources such as land and water. Access, quantity and quality will be guiding themes throughout this paragraph. In the third part the case of the Tucuruí dam, Brazil, is being dealt with. With a short history and a stakeholder analysis the situation will be explained.

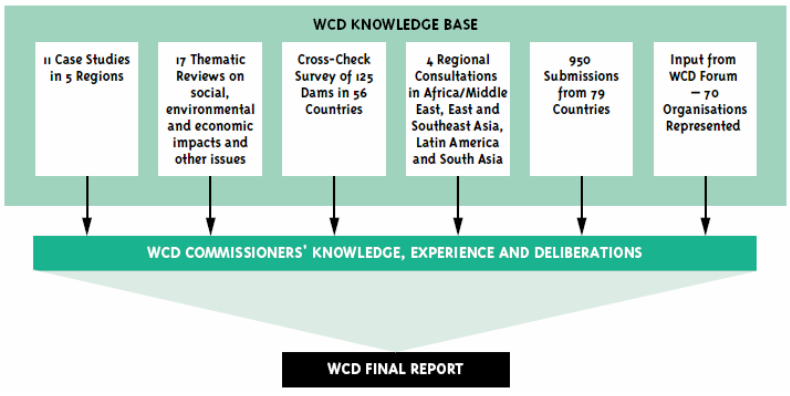
Due to time restrictions and lack of specific data there was no possibility of linking the theoretical framework with the case of the Tucuruí dam. In this sense, the paper should be seen as a preparation for further research on large dams in relation to resources, in a perspective based on rights and responsibilities.

The global debate on large dams and International Organisations

In this section two international organisations will be described which are also relevant for the case of the Tucuruí dam. But foremost, they will give an impression of the global debate on large dams. First, the World Commission on Dams (WCD) is being dealt with and secondly the International Commission on Large Dams (ICOLD).

The history of the World Commission on Dams starts in the early 1990s, when dam-affected populations, grassroots movements and NGOs around the world started to criticise the World Bank funded projects. In 1994, on the 50th anniversary of the World Bank, 2,000 organisations signed the Manibeli Declaration, demanding the World Bank to work on an 'independent comprehensive review of all Bank funded large dam projects' (IRN, 2002). During the first international conference on dam-affected people, held in 1997 in Curitiba, Brazil, the Dam-Affected People Association (MAB, see above) again pleaded for an international independent organisation, in order to research social, economical and environmental impacts of large dams. Later that year, with the support of the World Bank and IUCN – The World Conservation Union – a workshop was organised in Gland, Switzerland. About 39 participants from governments, the private sector, international financial institutions, civil society organisations and affected people came together. An agreement was made to work together in order to establish the World Commission on Dams, which started its activities in may 1998 (WCD, 2001a).

During the workshop it was decided that the World Commission on Dams would maintain two overarching goals. The first goal was to review the development effectiveness of dams and assess alternatives for water resources and



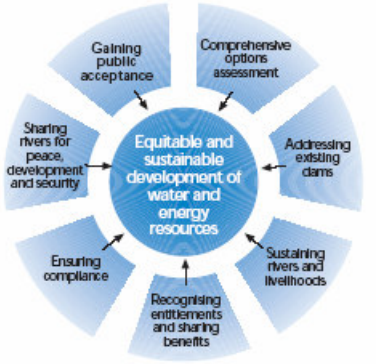
Source: IRN, 2002

energy development. The second goal was to develop internationally accepted standards, guidelines and criteria for decision-making in the planning, design, construction monitoring operation and decommissioning of dams. A final report with the conclusions of the Commission was due to be finished by June 2000 (WCD, 2001b).

The conclusions of the report underlined in many cases the concerns of many NGOs and grassroots movements towards large dams. First, the Commission concluded that the social costs of dams are overwhelming and too many times ignored. Moreover, the Commission found that between 40 and 80 million people around the world have been resettled for dams. Second, the environmental costs of dams are huge, often not foreseen, and in many cases unavoidable. Lastly, dams often fail to provide the calculated benefits. Although the Commission admitted that dams can certainly be beneficial, the real benefits are often lower than the projected benefits on which decisions to build a dam are based. More specifically, this applies to power production, which is often less than calculated. Considering irrigation systems, about 70 percent did not reach the fixed targets. Lastly, the claim that dams would help in controlling floods often appears to be opposite: they often have increased human vulnerability to floods (IRN, 2002).

In order to learn from the lessons of the past, the Commission set up a 'constructive and innovative way forward' for decision-making in the form of seven strategic priorities. The combining these priorities leads to the main goal: equitable and sustainable development of water and energy resources (WCD, 2000g).

- Gaining public acceptance
- Comprehensive options assessment
- Addressing existing dams
- Sustaining rivers and livelihoods
- Recognising entitlements and sharing
- Benefits
- Ensuring compliance
- Sharing rivers for peace, development and security



Source: WCD, 2000g

The question remains what influence the World Commission on Dams really had with its report. The Commission's findings have resulted in a broad range of reactions and official responses. Some of them were very positive other negative and a lot of reactions were mixed. Many NGOs and some international organisations supported the report and asked for its adoption and implementation. Some other organisations, governments and companies rejected the report. Naturally, to measure the true effects of such a report is an almost impossible task. However, it is clear that NGOs, grassroots movements and dam-affected people now have the support of an international and legitimate Commission, which can strengthen the influence of their actions. Moreover, there have been signals that some dam building companies are integrating the WCD's strategic priorities into their policies (IRN, 2002).

Another important international organisation is the International Commission on Large Dams (ICOLD). The first ideas to establish such a Commission date back to 1925, when the Conference on Hydro-Electric Power and the Conference on the Development of

Science were being held in Grenoble, France. The initial purpose of this Commission was to install an international forum for discussion, assigned exclusively to large dam engineering issues. During the World Power Conference in Basle (Switzerland) in 1926, a French delegation presented a proposal, which became assigned to the French government. The Foundation for Hydro-technology of France (Société Hydrotechnique de France) designed a Constitution for the new Commission which was approved in Paris July 1928. In October 1928 the Executive Council of the World Power Conference in London voted to officially recognise The International Commission on Large Dams (ICOLD, 2005a).

At present, ICOLD has National Committees from 82 countries, with about 7,000 individual members. Originally, the aim of ICOLD was 'to encourage advances in the planning, design, construction, operation and maintenance of large dams and their associated civil works, by collecting and disseminating relevant information and by studying related technical questions' (ICOLD, 2005b). From the late sixties onwards, ICOLD concentrated more on contemporary issues such as dam safety, monitoring of performance, reanalysis of older dams and spillways and effects of ageing and environmental impact. Currently the goals are being put into practice by technical committees, three-yearly congresses, technical lectures and workshops (ICOLD, 2005b).

It is useful to shortly compare the World Commission on Dams and the International Commission on Large dams. The WCD was established after criticism on the World Bank and the need for an independent analysis on the social, economical and environmental impacts of large dams. Furthermore, the organisation was only meant to exist for two years, in which its tasks were completed. The International Commission on Large Dams focuses mainly on technical aspects of dams, and is a permanent organisation.

In this perspective ICOLD's criticism on the final report of the WCD can be explained. ICOLD stresses that the WCD 'has made an extremely energetic effort to bring the debate on the pros and cons of dams to a higher level'. But ICOLD also states that in the Final Report the pros and cons of large dams are not always balanced out. First, as ICOLD pleads, the report does not mention that dams are often the only solution to water problems. Second, ICOLD argues that the WCD failed to make an objective and scientific assessment of the alternatives to large dams for water supply, power generation and food production. Lastly, ICOLD claims that the WCD report focuses on the five percent of the people who have not benefited from dams and, therefore, ignores the benefits to the majority of the people (WCD, 2001c).

Rights and natural resources

In this paragraph we will explore possibilities to analyse water as a resource, in the perspective of rights and responsibilities. Considering water as a resource, one can state that water has a direct, both short and long term importance for life on earth. The United Nations (1997) has defined this as follows: 'access to water is fundamental to survival and critical for reducing the prevalence of many water-related diseases'. The exploration of this paragraph will be kept broad, in order to not exclude other resources such as land. Thus, the framework might be applicable to several resources in relation to large dam discussions.

Hence, this part of the paper offers a framework for analysis which is foremost useful to gather data on resource oriented subjects in a structural way. Using and applying the framework with a literature study only is possible, but requires very specific data on a specific resource. Since it was not possible to find such specific information on the Tucuruí dam, the framework will not be applied in this paper.

This section will first deal with water as a social good and as an economic good, from a demand orientated perspective. Then we will make the step to water as a public good and as a private good, but now from a supply oriented perspective.

Social good or economic good?
To view water solely as an economic good has certainly advantages, while a more efficient use of water might be achieved. This is especially the case in terms of incentives for saving water, since water should be regarded as a scarce resource. However, viewing water only as an economic good also has disadvantages, since equal access to water – with special reference to 'poor people' – might be harder to achieve (derived from Hansson, 2004). Gleick et al (2002) describes the paradox as follows: '….how to get the most value from water that is available, while not depriving people of sufficient clean water to meet their basic needs'. Thus, it seems logical to regard water both as an economic and as a social good. Indeed, the two are inevitably complementary. This vision was also supported by the participants of the United Nations Conference on Environment and Development (UN, 1992):

> "……water [is] an integral part of the ecosystem, a natural resource and a social and economic good, whose quantity and quality determine the nature of its utilization. To this end, water resources have to be protected, taking into account the functioning of aquatic ecosystems and the perenniality of the resource, in order to satisfy and reconcile needs for water in human activities."

By disentangling the paradox it can be revealed that both social and economic goods are directly related to three issues: access, quantity and quality. Below, this issue will be explored in more depth. It has to be mentioned that the possible consequences are being examined. Therefore, some situations described below might not be applicable to all large dams. Furthermore, this section will primarily focus on the consumers' side, whereas the section on water as a public or private good focuses mainly on the producers' side.

Water as a social good
Social goods are those that have significant 'spill over' benefits or costs. Under this definition, water is a social good because the availability of clean and affordable water improves both individual and social well-being (Gleick et al, 2002). The definition itself already pushes towards the three issues mentioned above, namely access, quantity and quality.

Access to water as a social good has been part of a long lasting discussion on the theme of fresh water. The United Nations (1997) has included the issue of access in a report, stating that 'access to water is fundamental to survival and critical for reducing the prevalence of many water-related diseases'. This statement also shows the interconnection between access, quantity and quality. Indeed, in the end it is a matter of people being able to get enough clean water to sustain their living.

But what kind of influence can a dam have on water – as a social good – considering access, quantity and quality? Generally there are two kinds of problems: those people who are being affected upstream, and those who are affected downstream. Upstream from dams, large areas are being flooded, which requires people to move other places. In this paragraph we will not deal with this group, since there is too much differentiation in the possible places where people (have to) go. Therefore we will focus only on the downstream group.

Access to water as a social good for people living downstream of a large hydroelectric dam can be a true problem. There are many examples showing that a decrease of the amount of water can become one of the key problems for this group. Thus, both accessibility and the quantity of water is being influenced. The possible results of a lack of accessibility and quantity can be water shortages and droughts. Water as a social good in such cases has a significant 'spill over' of costs due to the impact of the dam in question. However, there are also examples of significant 'spill-over' of benefits, especially when it comes to new opportunities for irrigation. In general this implies a larger amount of water that can be used, and a more regular distribution of irrigation water over the year. The benefits of the social good of (irrigation) water might thus be – although on the long term – a higher living standard.

Considering the quality of the water, there have been reports of contaminated water in the downstream parts of rivers. Furthermore, the effect of an enlarged surface of water is often that water related diseases such as malaria, leishmaniasis and schistosomiasis are easily spread out (Altinbilek, 2002). Sometimes the impact of large dams on the quality of water can be even larger, such as the reports of influences on the processing of drinking water.

It can be concluded that water can be a social good due to several reasons, which are connected to access, quantity and quality. Thus, water as a social good is about equitable access and distribution, and about the health of (local) people. A consequence of water being a social good – at least partly – is that it requires governmental action, oversight or regulation (Gleick, 2002).

Water as an economic good

Water as an economic good can be defined as water that will be allocated across competing uses in a way that maximizes the net benefit from that amount of water. Allocation of water can take place through markets, through other means (e.g. democratic or bureaucratic allocations) or through combinations of market and non-market processes (Gleick, 2002). That water should be regarded as an economic good was already supported by the participants of The International Conference on Water and Environment, held in Dublin 1992. It was concluded that 'water has economic value in all its competing uses and should be recognized as an economic good' (ICWE, 1992 in Gleick et al, 2002). Below, we will again focus on access, quantity and quality, but this time on water as an economic good. It is assumed that downstream users of water are competing with each other (internal competition) but also with 'the dam' (external competition). Furthermore, in the line of economics, we have to assume that water is scarce.

More or less accessibility to water as an economic good, as a consequence of large dams, can be related to effects on the income of people. Especially problems on access to water to irrigate fields can have a dramatic impact on the income of agricultural communities, namely in terms of reduced yields. On the opposite, it also happens that dams provide new opportunities for irrigation, and thus help to increase the income of local farmers. However, this is also related to accessibility of funds for farmers to join an irrigation network. Another possible effect of a lack of accessibility of water in economical terms is the often reported reduction in catchments of fish, which again influences people's income. The connection is quite simple: less access to water generally means less access to fish stocks. On the other hand, the large reservoirs created by dams provide new accessibility to fish stocks, which can help the surrounding communities to generate an income. These fish stocks can increase to exploitable proportions after three to five years after the closure of the dam (WCD, 2000c)

Concerning the quality of water as an economic good, the storage of water in reservoirs causes physical, chemical and biological changes in the stored water. As a consequence, the composition of the water entering the reservoir compared to the water leaving the reservoir can be different. This might lead to several possible processes (WCD, 2000a).

First of all, there can be an accumulation of salt in water and soil, which is called salinisation. Naturally this causes problems for farmers downstream that are irrigating their fields (Hart *et al*., 1991 in WCD, 2000a). Second, water storage in reservoirs might have an impact on the temperature of the water. It mainly depends on the depth from where the water is withdrawn from the reservoir. This can have both a positive as a negative influence on ecosystems downstream (Davies, 1999 in WCD, 2000b). Consequently, this might have an impact on social groups being dependant on fish stocks. Thus, the influence of dams on the temperature of water might eventually have an influence on the income of people living downstream of large dams.

It can be concluded that water can also be an economic good, since water is – per definition – a scarce resource and thus people will be in competition considering this resource. Thus, water can be also be seen as a commodity product in which people can trade. Indeed, water can or maybe should be –at least partly – fit into a free market system.

Water as a social and economic good

After the analysis of water as a social good and as an economic good, both from a demand oriented perspective, a summary can be made consisting of a table. This table is applicable for the resource of water, but also for land, and possibly other resources.

	Demand	
	Social	Economic
Access	Equitable	Efficient Competition Commodity
Quantity	Equitable	Efficient utilisation Competition
Quality	Safe Individual and social well being	Safe

Table for analysing resources from a demand oriented perspective

The paragraph above shows that for a rational discourse, it is of crucial importance to regard water as a social good and as an economic good. To focus only on the social part means disregarding the scarce feature of water and the fact that water in many cases already is a commodity product. On the other hand, to focus only on water as an economic good, means that equitable accessibility and utilisation will be left over to the free market system. This system functions well, but it can often not provide in the needs of the less advantaged or weak groups in society. It is thus necessary to find a compromise between two objectives. Firstly to give enough incentives for saving water and an efficient utilisation. Secondly, to offer opportunities for weak groups in society to have accessibility to water (derived from Hansson, 2004). Both objectives should be achieved with the joining forces of governmental action in combination with the free market system. To explore this in more depth, we will have to analyse water in the perspectives of public and private goods.

Public good or private good?

In the paragraph above it was concluded that water should be regarded as both a social and an economic good. As a consequence, governmental action should be – generally spoken –combined with the free market system considering the management of water. In this perspective it is certainly relevant to explore the characteristics of water as a public good and as a private good. Hence, in this paper we will maintain a difference between a public good and a social good. A social good is not necessarily provided by a public institution, whereas a public good is indeed provided by a public institution. Second, people can be excluded from a social good, but not from a public good. Third, analysing water as a social good has been done from the perspective of the consumer, but water as a public good will be done from the perspective of the public institution that is responsible for access, quantity and quality. A difference between water as a private good and as an economic good is also being maintained. By analysing water as an economic good we are concentrating mainly on its utilisation (demand), not on its supply. However, if we focus on water as a private good, we will focus mainly on the provision of water by private institutions or firms. Apart from that, water as an economic good does not necessarily mean that it has been produced. It only means that competition on this resource is possible. Private goods however, are indeed produced and/or controlled by private institutions or firms.

This section is set up along the same framework of the section above. It means that both the part on water as a public good and as a private good will be analysed with the themes of access, quantity and quality.

Water as a public good

A public good can be defined as a 'good or service that bestows collective benefits on members of society, from which no one can be excluded' (derived from Case et al, 1996). In this sense, access, quantity and quality of water can be regarded as a responsibility of one or more public institutions. In general such responsibility is translated into policy on one or more public levels. Thus, in this section there will be a focus on public policy on access, quantity and quality of water, in relation to large dams. In order to control the complexity of this paper, a public institution will be interpreted as a governmental institution.

To analyse water as a public good from the perspective of governments, we need to know more about what can be expected from these governments. We also need to know what kind of roles governments can play in the field of water management. First of all it has to be stated that governments around the globe do have a fundamental duty to guarantee that basic services such as water are provided to their people (derived from Gleick, 2002). Moreover, access to enough clean water is a full responsibility of a government, as will become clear below. Second, the roles of governments considering water management can be divided into three categories: facilitator, financer and provider (Bosch et al, 2001).

For a government as a facilitator, there are three possible instruments to facilitate: laws, regulations and institutions. With these instruments governments can have influence on demand-responsive and cost-conscious provision of goods and services such as water. They can also influence competition on the water market in relation to private institutions (Bosch et al, 2001). As a financer, governments – often in combination with private institutions – can act in three possible ways. Firstly, they can provide conventional capital aid, in the form of support for specific projects and activities. Second, governments can offer technical cooperation, for example by sharing skills. Third, there are the more general options for governments to provide resources more strategically, and thus supporting sector-wide programs (derived from Bosch et al,

2001). Naturally, subsidies are the well known way to put these forms of financing into practice. On this subject there has been quite some criticism, both economically as socially. In general subsidies tend to cause a higher waste of water and higher costs for governments (Pagiola et al, 2002 in Hansson, 2004). Furthermore subsidies on irrigation water in developing countries tend to benefit the rich more than the poor (De Moor and Calamai, 1997 in Hansson, 2004). Lastly, there is the role for a government to act as a provider. In this case the government is fully responsible for the provision of water, whether it is for utilisation in the form of irrigation or for domestic use. Especially weak governments in developing countries tend to be ineffective and inefficient in the provision of water (Sachs, 2002 in Wolff, 2004). Having shortly dealt with the possible roles of governments in managing the resource of water, the step will now be made to the themes of access, quantity and quality.

Concerning the responsibility for governments on access to water for its citizens, it has to be analysed what the 'status of water' is, according to the international community. Already in 1946 the right to health was recognised through the Constitution of the World Health Organisation (WHO, 1946 in WHO, 2003). In 1948 this right was included in the Universal Declaration of Human Rights of the United Nations, stating that:

> "Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services……." (article 25; UN, 1948).

The United Nations Committee on Economic, Social and Cultural Right adopted a General Comment in 2000 in which the right to health was related to the factors that determine good health (WHO, 2003). For the first time, access to safe drinking-water was included in an international covenant; however, it was still not a human right. In 2002 the same Committee stated that water itself is an independent right, because 'water clearly falls within the category of guarantees essential for securing an adequate standard of living, particularly since it is one of the most fundamental conditions for survival' (WHO, 2003). This means that all nation-states who are a member of the United Nations have an obligation to make sure that the minimum level of this right is realised. Concerning water, this minimal level includes the obligation of governments to ensure people's access to enough water to prevent dehydration and disease (WHO, 2003).

Referring back to the main theme of this section – access to water as a public good – it can be concluded that governments indeed have full responsibility when it comes to access to enough clean water for its citizens. From this conclusion the question can be raised how it is possible that there are so many controversial issues on access to water in relation to large dams. What does the fact that water is a human right actually mean for those who are affected by the impact of large dams? Does it make a difference at all? These are very complicated questions to answer, but certainly not less important. Unfortunately these questions cannot be dealt with in full length in this paper. However, it can be concluded from many reports on large dams, that especially in countries with weak governments, that the right to access to enough clean water remains a 'silent written right' that can often not be put into practice.

If governments – whether they are weak or not – are not totally able to guarantee access to enough clean water, one should have a look on alternative options. In the next section this will be done with the analysis of water as a private good.

Water as a private good

A private good can be described as a product which is produced by one or more firms in order to sale it to individual households (derived from Case et al, 1996). Contrary to the public good, control over access, quantity and quality lies with a private party that produces the good or service. Thus, in this section we will have a look at the capability of firms to provide enough clean water which is also accessible. The word 'capability' is used instead of 'responsibility' because firms do not have a legal responsibility to provide accessibility to enough clean water for *all* citizens, whereas governments do, according to the Universal Declaration of Human Rights (see the section above).

To be consistent, water as a private good will be analysed in the same way as in the section on water as a public good. This implies that we will firstly concentrate on the roles that firms might play in relation to the provision of water. Second, there will be a focus on the expectations one can have towards firms. Again, access, quantity and quality will be guiding themes throughout the section.

Firms do not have a role as facilitator, since they do not have the possibility to create laws and regulation that is applicable for all citizens in a country. As a financer, firms indeed do play a role. Like governments, firms can also provide conventional capital aid. The main difference between the two is that a firm will expect a return in money on a certain term, since the firm has been established to make profits. A government can also make a profit, but this is not the main goal of its existence. Firms can also share skills or knowledge, which is comparable with the technical cooperation of a government. The provision of skills or knowledge will also be based on the profit making principle. By far the most important role for firms is being a provider of the private good of water. Considering large dams, this is interesting with respect to companies that can become a provider of water. For instance, a company who owns a dam, also controls the amount of water that is being held in the basin, and the amount of water that is leaving the basin through the dam.

The second issue to be handled is the expectations one can have in relation to firms. Do firms have a responsibility towards people, considering access, quantity and quality of water? Do they have to guarantee access to enough clean water? Naturally, in order to answer these questions, we have to know more specifically what kind of firm we refer to. If it concerns a company that produces drinking water one can expect this water to be safe for drinking, and that the price of this water is being determined by supply and demand. Thus, as long as the consumer is willing to pay for water, there is no problem in relation to quantity and quality. But what if a consumer is not able to pay for high prices? Then it becomes a matter of access to water. Contrary to governments, firms do not have a legal obligation to guarantee access to water for all groups in society. In such cases, a vacuum is being created for weak groups in society.

Water as a public and private good?

After the analysis of water as a public good and as a private good, this time from a supply oriented perspective, another summary can be made, again consisting of a table (see next page).

Above, we have dealt with water as a public or private good. This might imply that there is a clear distinction between public and private. In reality, this is often not the case. Therefore, issues on responsibility and expectations become fuzzy. This is exactly the reason of why it is important to analyse and explain problems on resources such as water.

	Supply	
	Public	Private
Access	• Exclusion not possible • Legal responsibility • Less efficient • Subsidies	• Exclusion possible • No legal responsibility • More efficient • Investment in profitable areas • Commodity
Quantity	• Less efficient production • Legal responsibility	• Efficient production
Quality	• Moral responsibility • Legal responsibility • Steered by obligation • Less efficient • Safety	• Moral responsibility • No legal responsibility • Steered by market • More efficient • Safety

Table for analysing resources from a supply oriented perspective

The 'status of water' of water can also change. Before the construction of a dam water is a public good coming directly from a river. In this case changing quantities mainly depend on seasonal fluctuations such as rainfall. But the characteristic of a public good still applies: no one can be excluded, at least not with artificial means by governments. After the construction of a dam, water has become 'privatised': it is coming from a basin and the amount of water flowing downwards is being controlled. Now it is possible to exclude certain social groups living in affected areas, but it is also possible to give certain other social groups the privilege of extra amounts of water.

In theory we can conclude that where the free market system fails to provide access to enough clean water – referring to weak groups in society – governments can assist in helping these groups out of the vacuum. Therefore the key problems can be found in countries with relatively large weak social groups in combination with a weak government. These governments are incapable of their legal obligation to provide access to enough clean water. Companies are not interested in these groups because their investments will not be profitable. Thus, weak social groups will continue to be locked in a vacuum created by these two parties. In short, this means that they become self-responsible for access, quantity and quality of water.

The Tucuruí dam: a short history

Already in the 1930s, Brazil was facing a growing demand for electricity, in combination with a widespread lack of capacity to produce electricity. From the year 1972 until 1975, explorations were made for damming the Tocantins River. During 1976 preparations are being made to construct the dam, and eventually in 1984 the dam was finished. Considering the costs of the project, it was estimated in 1974 that the total construction costs would be US$ 3.60 billion with the costs for interest during construction not included. In 1986, after the project was finished, the real costs were estimated to be US$ 5.53 billion (WCD, 2000d). This huge increase of costs can be explained as a result of delays and changes in design and materials (Fearnside, 2001). Eletronorte is the company that developed the dam and

Source: WCD, 2000e

operates it. Eletronorte was also the most substantial financer of the project, contributing 45.7% of the total project costs. Other financers included Brazilian banks and credit agencies, contributing 40% of the costs and foreign banks and international credit agencies, supplying 14.3% of the costs (WCD, 2000e).

When the project was finished, the Tucuruí dam in Northern Brazil became the largest dam that had ever been built in a tropical rainforest. From 1984 until present, the water flowing from the Tocantins River has been blocked, flooding an area of approximately 2430 km^2. Currently, the dam provides about 4,000 Mw of electricity (Fearnside, 1999), serving most of the energy market for about eight million people in the states of Pará, Maranhão and the Northern Tocantins States (WCD, 2000e).

Stakeholder analysis

The paper will now be continued with a stakeholder analysis. The goal of this analysis is to create a clear overview of the parties that are involved in the project of the Tucuruí dam. The analysis will also make clear what the specific impacts were of this dam. In short, it is an in depth exploration of large dam discussions.

Managing the electricity sector: Eletronorte

This state-holding electricity company was established in 1973 as one of the four regional divisions of Eletrobrás (Centrais Elétricas Brasileiras S/A). Eletronorte is focussing specifically on the public power services in the northern part of Brazil. This means that Eletronorte covers all of legal Amazonia, which is 58% of the land area of Brazil. Currently this includes the states of Acre, Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima and Tocantins (WCD, 2000e).

At this moment Eletronorte is the operator of four hydro turbines, which include the dams of Balbina, Samual, and Coaracy Nunes. Furthermore, the same company also owns four gas turbines, four diesel fuelled electricity generators, and two steam turbines (Eletronorte, 2005). Of all these projects, the Tucuruí dam is by far the largest one.

Eletronorte was initially created by Eletrobrás to carry out the ideas of building a large dam in Amazonia. This means that Eletronorte was responsible for the development of the Tucuruí dam, and still is responsible for operating the turbines.

We will now focus in more depth on how Eletronorte dealt with the different impacts of the Tucuruí dam. In 1977 – the construction was already underway for two years - Eletronorte decided to hire a consultant to make an 'environmental assessment' (Fearnside, 1999). It was the ecologist Robert Goodland, publishing a report in 1978 with the conclusion that Eletronorte should create a deforestation programme, in combination with a social and cultural inventory of the affected communities (WCD, 2000e). More specifically, Goodland reported that more than 60% of the affected communities had no land titles, and therefore these people would run the risk of not being compensated (Fearnside, 1999).

In the line of these recommendations Eletronorte signed an agreement in 1980 with the National Research Institute for Amazonia (INPA - Instituto Nacional de Pesquisas da Amazonia). This institute was given the responsibility to conduct research on climatology, limnology, water quality, plant life, epidemiology of epidemic diseases and fish-life in the reservoir area. Although the institute produced lots of valuable information on these subjects, quite some critique was also expressed. First, the research was conducted at least a decade too late, and second, it did not cover the whole region, because the area was too large and there was not enough time for the researchers. But the reports that were produced could often not answer simple questions on environmental quality. This was caused by the complexity of the

ecosystems, lack of basic information on these ecoysystems, lack of objectivity in some of the studies and finally, lack of proper systematic information storage (WCD, 2000e).

As Goodland predicted, serious problems started to arise after completion of the dam, especially in relation to resettlement programmes. Due to a lack of efficient registration, some families were not compensated by Eletronorte (WCD, 2000d). The compensations were generally too small, and payment was subject too repeated delays (Fearnside, 1999).

In the following section the step will be made to the description of the local people living in the affected areas.

Local people in the affected areas

According to an estimation of Eletronorte in 1979, 9,500 people in 13 villages would be displaced by the effects of the dam. After the dam was completed, the facts showed that 32,871 people were dislocated. Many of them had been resettled by Eletronorte, but 3,700 people had to be resettled again because they appeared to be relocated in the reservoir. Still, one year after completion of the dam, 1500 families were homeless (Fearnside, 1999).

Among these communities are indigenous people of different reserves. The reservoir eventually flooded the areas of the tribes of Parakana (36% of the submerged area belonged to them), Pucuruí and Montanha. The transmission lines cut through the areas of four other tribes, which are Mae Maria, Trocara, Krikati and Cana Brava (WCD, 2000e).

Especially the economy of downstream communities – mainly consisting of fishermen and small scale farmers – had been destroyed as a direct result of the dam. Almost none of them were ever consulted about their opinion of the dam, or their vision on resettlement programmes (WCD, 2000e).

Religious leaders, together with grassroots movements have been expressing their deepest concern from the beginning onwards. They felt that the construction of the Tucuruí Complex destroyed cultural assets that were characteristic for the lifestyle of communities living on de riverbanks (WCD, 2000e). Eventually, in 1987, Eletronorte and FUNAI (Fundac¸ai Nacional do Indio/National Indian Agency) decided to set up a programme for affected communities, assisting in the improvement of education, health and infrastructure (Fearnside, 1999).

Brazilian government

If one wants to make clear why the Tucuruí dam had such large impacts on local communities, it is relevant to analyse the Brazilian government in this perspective. In these times it is very easy to criticise policies of the past. Therefore we should bring such criticism in relation to the political situation of the time that the Tucuruí dam was constructed.

For this, we have to go back to the 60s of the 20th century, when a coup took place in Brazil. Disturbed by the spreading chaos of the Goulart presidency and fearing a leftist takeover, the military staged a ‘coup d’etat’ in 1964. This coup brought a geopolitical doctrine, focussing on the central, national political arena (Foresta, 1992).

The new government began to formulate and implement a project based on its doctrine of security and development. In 1966 the government launched Operation Amazonia, which reflected military-style thinking and goal-oriented aggressiveness of the Brazilian geopolitical doctrine. This initiative focussed on increasing the region’s population and forcing a growing impact of economy (Foresta, 1992). It was decided that Amazonia should be a top national priority and a target territory for initiatives on economic development (WCD, 2000e). Under the program, roads were renovated and

constructed in order to create better links between Amazonia and the rest of Brazil. Two institutions where established to guide these new developments: the Superintendency for Amazon Development and a new regional development bank named the Bank of Amazonia. This last institution decided together with the Brazilian regime that tax exemptions in Amazonia would apply for all investors (Foresta, 1992).

More specifically, energy production in Brazil during the 60s and 70s of the 20th century was considered as a question of national security. Policies concerning important areas such as Amazonia were in the hands of central governments. Regional governments had no influence in the decision making processes and could not make any claims towards the way in which energy should be distributed or how it should be used (WCD, 2000f).

All in all the new military regime implied a very clear but incomplete view on Amazonia. According to Arnaldo Carlos Muller (1995), environmental and social policies in relation to dam construction were very limited. He points out that in the political context of that period; dams did not produce 'impacts'. Officials only talked about the 'effects' of dams, and they always highlighted that among these effects there were many benefits (WCD, 2000f).

In the 70s, Brazilian authorities gradually started to introduce environmental and social issues in their agendas, mainly because of the pressure of international conferences. This resulted in the establishment of the Special Environmental Secretariat (Secretaria Especial de Meio Ambiente), which became in charge of designing national development plans with more attention to environmental issues. But since the energy sector was still a matter of national security, the authorities decided to not include this sector within the tasks of SES. The importance of this sector also became clear with the establishment of a law for indigenous people. With the 'Estatuto do Indio' or law 6,001, the national government allowed for the construction of public works on indigenous lands. This was justified in the interest of national development and security, which were at that time two major issues of the military regime (derived from WCD, 2000f).

During the 1980s democracy slowly returned in Brazilian politics. Democratic forces which were repressed by the military regime gradually returned to power (Foresta, 1992). Eventually, with the new Constitution of 1989, the national policy on Amazonia really changed. Articles 231 and 232 are stating that the use of natural resources in indigenous lands can only be carried out with authorisation of the National Congress. Therefore, such usage requires a hearing with the affected communities and participation in the project results. Law 7,990, also established in 1989, confirms that states, districts and municipalities should be compensated for the use of hydraulic resources for the production of energy. Lastly, law 8,001 from 1990 defines how compensation should be distributed (WCD, 2000f).

In continuation of the democracy process, a parliamentary commission of inquiry in the Para State Legislative Assembly started to investigate problems caused by the Tucuruí dam by 1991. The commission adopted a long list of complaints, blaming the Brazilian government for its mistakes in the past. The International Water Tribunal condemned the Brazilian Government in the same year for the social, economic and environmental impacts of the Tucuruí dam. However, the Tribunal has only moral authority, and thus the effects of its conviction where mainly that the world was confronted with new impacts of a so-called perfect dam (Fearnside, 1999).

Grassroots movements and NGOs

When the construction of the Tucuruí dam already was in progress, continuing problems and inadequacies in the relocation process resulted in mass demonstrations, starting in 1981. Pressure on Eletronorte to start communicating in a more direct way with local

communities was rising. Grassroots movements however still faced the problem of not being considered as legitimate spokespersons in order to influence public policies. This can also be related to the military regime of that time. Policy was ultimately top/down, let alone bottom up.

After significant pressure, Eletronorte finally esthablished a parity committee in order to start the dialogue with the grassroots movements which were involved in the demonstrations. The goal of this committee was to find solutions to outstanding matters of compensation and resettlement. After many negotiations, 2,247 cases were being dealt with, and in the end 2,121 of them were solved. Other issues and the remaining 126 cases were being handled by an interministerial committee that was created in 1994 (WCD, 2000e). Finally the ignorance of grassroots movements had changed after considerable pressure, resulting in the establishment of two important committees.

One of the most important national NGOs in Brazil is the Dam-Affected People Association (MAB - Movimento dos Atingidos por Barragens). This group was established in the 1980s, combining struggles of people affected by dams in several regions of Brazil. Already in the 1970s, when the military regime forced thousands of people to move in order to construct new dams, small farmers, union members, agrarian reform activists and church organisations began to organise the resistance to these new dams (IRN, 1997 & IRN, 2000).

Since the beginning of its existence MAB works to defend the rights of dam-affected populations, claiming for their losses and their participation in planning and implementing resettlement. MAB criticises the construction of large dams and works to make the public and government officials fully aware of the social, economical and environmental impacts that dams can have (IRN, 2000).

MAB tries to achieve its goals in several ways, such as demonstrations, but also via workshops and conferences. The establishment of the World Commission of Dams in 1997 was especially pleaded for by this organisation. Through the efforts of this movement, social issues around dams are treated more carefully now, and usual procedures are being reassessed (WCD, 2000e).

Conclusions

In the first part of this paper we have explored the debate on large dams with the description of two international organisations. Especially during the last two decades NGOs and grassroots movements have demanded attention for the severe negative social, economical and environmental impacts that dams can have. This was confirmed by the final report of the World Commission on Dams. But one should not forget that dams have brought a lot of prosperity too, especially in relation to improved irrigation systems, flood control, and provision of electricity. This was the critique of the International Commission on Large Dams: the report of the WCD is focused too much on negative aspects and too less on positive aspects. Apart from that, as ICOLD states, it is very easy to criticise large dams, but sometimes there are just no alternatives for generating electricity. In short, efforts have to be put into a balanced debate on large dams, where both the pros and the cons are being dealt with.

In the second part of the paper an attempt has been made to construct a framework for analysing resources, with a special reference to rights and responsibilities. In relation to large dams, especially the resources of water and land are relevant. In the discussion on resources, three factors play a main role: access, quantity and quality. Second, it is also important what the ‘status’ is of water: a social, economic, public or private good. Lastly it is also essential to look at the demand side on one hand, and the supply side on the other.

Considering water as a social and economic good, viewed from a demand oriented perspective one can conclude the following. All people have the human right to have access to enough safe water, in combination with an efficient utilisation. The supply oriented perspective helps us in applying this. Considering water as a private good, the free market system can assist in providing enough clean water. But for weak social groups that are possibly not interesting to invest in, governments do have a legal and moral responsibility to assist these groups. In countries with a weak government, social groups can be locked into a vacuum between public and private parties. This means that they become self responsible for access, quantity and quality of water.

Due to time restrictions this framework has not been applied to the case of the Tucuruí dam. The framework also requires very detailed information, which is sometimes hard to get by a literature study only.

In the third part of the paper we have focused on the Tucuruí dam of Brazil. Corresponding with the Final Report of the World Dam Commission we have seen that many things went wrong during the construction of this dam and afterwards. In total 35,000 people have been displaced because of this dam. Many economies of downstream communities have been destroyed, because of decreasing fish catchments and harvests. The ecological damage was also severe: almost 2500 km^2 of rainforest became flooded, water quality of the river decreased and fish populations and diversity dropped.

Again, it is very easy to criticise the way in which Eletronorte and the Brazilian government dealt with these impacts. One should not forget however, that a military regime ruled this country when the dam was build. This was a regime that was top/down organised, with a primary target on the economical viability of Amazonia. It is certainly not an excuse for all the things that went wrong, but it helps explaining the case of the Tucuruí dam. Nowadays NGOs and grassroots movements have made great efforts to get attention for those who are not compensated for their losses. The democratised government of Brazil has listened to their complaints and has worked on solutions. However, even today there are still displaced people who have not been compensated.

The Brazilian government and Eletronorte are now working on Tucuruí II, an extension of the original Tucuruí dam. By now it is time for these two parties to learn from their mistakes in the past and apply these lessons for a more sustainable future.

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Front cover local inhabtitant with fish:
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